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Pressure injection mould for tooth brushes made by successive injection in several sections

Patent Number: DE19522122
Publication date: 1997-01-02
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Requested Patent: ☐ DE19522122
Application Number: DE19951022122 19950619
Priority Number(s): DE19951022122 19950619
IPC Classification: B29C45/14 ; B29L31/42
EC Classification: B29C45/16C3
Equivalents:

Abstract

A pressure injection mould (6) makes plastic brush, esp. toothbrush, bodies consisting of several, successively injected components. It has mould plates (7, 8) on the nozzle- and ejection sides respectively, with opposing mould cavities (14). The mould (6) is constructed as a reversible tool, with a rotatable, reversible section allocated to the ejection side mould plate. There are several gps. (10, 11) of mould cavities (14) in the mould plates. To each gp. in the ejection side mould plate (8) a reversible section (12, 13) is allocated.

PTO 03-0279

CY=DE DATE=19970102 KIND=A1
PN=19522122

PRESSURE INJECTION MOLD FOR TOOTHBRUSHES MADE BY SUCCESSIVE INJECTION IN SEVERAL SECTIONS
[Spritzgußform zum Herstellen von Kunststoff-Bürstenkörpern]

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UNITED STATES PATENT AND TRADEMARK OFFICE
Washington, D.C. October 2002

Translated by: FLS, Inc.

PUBLICATION COUNTRY	(19) :	DE
DOCUMENT NUMBER	(11) :	19522122
DOCUMENT KIND	(12) : (13) :	A1 PATENT APPLICATION
PUBLICATION DATE	(43) :	19970102
PUBLICATION DATE	(45) :	
APPLICATION NUMBER	(21) :	19522122.2
APPLICATION DATE:	(22) :	19950619
ADDITION TO	(61) :	
INTERNATIONAL CLASSIFICATION	(51) :	B29C 45/14; B29L 31/42
DOMESTIC CLASSIFICATION	(52) :	
PRIORITY COUNTRY	(33) :	
PRIORITY NUMBER	(31) :	
PRIORITY DATE	(32) :	
INVENTOR	(72) :	FRIESE, WOLFGANG; DUFFNER, WOLFGANG
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TITLE:	(54) :	PRESSURE INJECTION MOLD FOR TOOTHBRUSHES MADE BY SUCCESSIVE INJECTION IN SEVERAL SECTIONS
FOREIGN TITLE	[54A]:	SPRITZGUSSFORM ZUM HERSTELLEN VON KUNSTSTOFF-BÜRSTENKÖRPERN

Description /1*

The invention relates to an injection mold for the production of plastic brush bodies, specifically, of toothbrush bodies or similar plastic pieces, consisting of successively injected components, with a mold plate on the nozzle side and on the injection side in which mold cavities are provided which, respectively, are assigned to one another, whereas the injection mold is configured as a reversible tool with a rotatable reversible section which is assigned to the molding plate on the injection side.

From DE-OS 4127621, an injection molding machine is already known to the art which exhibits an injection mold of the type mentioned at the beginning of the text. This previously known injection mold is designed as a reversible tool, so that a basic toothbrush body can be produced in one injection process and a sheathing of this basic body can be carried out in the second injection process into a finished toothbrush body. The previously known injection mold exhibits a stationary molding plate, as well as a movable molding plate which border several molding cavities between them. The movable molding plate exhibits a reversible section which is attached to the inside end of a slide guide which is rotatably run in the molding plate, on the injection side, which can be inserted in a receptacle cavity. The reversible section and

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*Number in the margin indicates column in the foreign text.

the movable molding plate are configured so that the molding cavities with their ends forming the holding area are arranged approximately pointing at each other and with their ends on the reversible section. Accordingly, the part of the molding cavities for the area of the brush body into which a second or additional injection material component is injected in an additional injection process is in the molding plate on the injection side so that it connects on the outside. Due to this arrangement, a particularly simple and space-saving construction of the injection mold results.

Because the measuring tolerances add up between the individual molding cavities, the number of molding cavities provided on the previously known injection molds cannot be increased as desired. Instead, this number of molding cavities in the previously known injection molds is limited by the size of the plate and the requirement for high dimensional accuracy.

Therefore, the objective is the creation of an injection mold of the kind mentioned at the beginning of the text with which a comparatively greater number of plastic pieces can be produced with the required accuracy during the individual work processes.

In the kind of injection mold mentioned at the beginning of the text, the realization of this objective specifically consists of several groups of molding cavities being provided in the molding plates and each group of molding cavities, respectively,

being assigned to a reversible section in the molding plate on the injection side.

Because several groups of molding cavities are provided in the molding plates of the injection mold in accordance with the invention and because each molding cavity group is assigned one reversible section of its own, the measuring tolerances in the area of the molding cavity groups can be kept so small that even a greater number of plastic pieces can be produced with the desired high accuracy. Moreover, the individual reversible sections have a relatively low rotation weight which is more easily managed in spite of the high capacity of the injection mold in accordance with the invention, and are of additional benefit to the high accuracy of this injection mold.

It is advantageous if two molding cavity groups are provided /2 specifically, if up to sixteen molding cavities are preferably assigned to each molding cavity group, and if the molding cavities are arranged in parallel to one another, specifically. This type of injection mold can be dimensioned in its outside dimensions and its weight, so that it can also be inserted into comparatively smaller injection molding machines.

It is expedient if the reversible sections respectively exhibit a part of the molding cavities which holds the brush head and a handle area of the brush body of partially injected brush bodies which projects towards the outside over the reversible

sections and if the rotational direction of adjacent reversible sections, as well as the position of the partial injection-molding stations and the finishing injection-molding stations of adjacent molding cavity groups are provided in such a way that the ends of the handle of, at least, one group of molding cavities pivot over the outside area which faces away from the adjacent molding cavity group. In this embodiment, the twistable reversible sections can be arranged at a comparatively small distance from each other without any disturbing contact of the plastic pieces of the individual molding cavity groups on the reversible sections during a rotating movement. Because the reversible sections respectively exhibit a part of the molding cavities which only holds the brush head, the reversible sections of the injection mold in accordance with the invention can be configured relatively small in their outside dimensions and, at the same time, with a reduced rotational inertial mass.

In order to be able to reduce the weight of the injection mold in accordance with the invention, and, especially, of its potentially movable molding plate on the injection side, even further, a preferred embodiment in accordance with the invention provides that the reversible sections exhibit a joint reversing drive for a synchronous reversing rotating movement and that the partial injection-molding stations and the finishing injection-molding stations of adjacent molding cavity groups are diagonally

arranged in relation to one another in a rotating movement of the reversible sections in the same direction, and the rotational direction for pivoting the projecting handle ends are preferably provided over the outside areas. Because the reversible sections have a joint reversing drive for a synchronous reversing rotating movement, the construction expenditure, as well as the weight which is connected with the reversing drive, can be substantially reduced.

Due to the diagonally opposite arrangement of the partial injection-molding stations and of the finishing injection-molding stations of the molding cavity groups, the plastic parts which are located on the reversible sections during the rotating movements between the work processes cannot even come into contact with each other if the reversible sections of the molding plate on the injection side are arranged at a small distance to one another.

However, it is also possible that the reversible sections respectively exhibit separate reversing drives for a reversing rotating movement which is mutually independent.

In order to facilitate a disturbance-free reversing movement of the adjacent reversible sections, a preferred embodiment in accordance with the invention provides that the distance of adjacent reversible sections is dimensioned for an overlap-free rotating movement on a joint plane, and that, with rectangular reversible sections, the distance of their rotary axes is greater

than double the length of the respective reversible section's diagonal.

In contrast, another advancement of the invention provides that the envelope curves of adjacent reversible sections will /3 overlap and that these reversible sections can be drawn out and pivoted successively, or that they can be drawn out different distances and on different pivot planes. Even with an arrangement of the reversible sections in relation to one another in which their envelope curves mutually overlap, a disturbance-free reversing movement of the individual reversible sections can be guaranteed if these reversible sections can be drawn out successively or for different distances from the molding plate on the injection side.

Additional characteristic features of the invention result from the following description of a configuration example in accordance with the invention in connection with the Claims and the drawing. In a configuration in accordance with the invention, the individual characteristic features may be realized by themselves, respectively, or in multiples.

The following is shown in schematic representations and on various scales:

Figure 1, an injection-molding machine with an open injection mold in a lateral view,

Figure 2, one of the two molding plates of the injection mold from Fig. 1 in a top view, whereas two molding cavity groups are provided in this molding plate to which one reversible section of their own is assigned, respectively,

Figure 3, a partial cross-section of the injection-molding machine from Fig. 1 in the area of its open injection mold,

Figure 4, a partial cross-section of the injection-molding machine represented offset by 90°, whereas one reversible section with toothbrush bodies held in it on the head side can be discerned,

Figure 5, the injection-molding machine from Figs. 1 to 4, whereas the open injection mold is shown with drawn-out reversible sections,

Figure 6, a lateral partial cross-section of the injection-molding machine from Figs. 1 to 5 with a closed injection mold.

Figure 1 represents an injection-molding machine (1) which is of service in the production of plastic toothbrush bodies (2) in a lateral view. The injection-molding machine (1) exhibits a locking unit (3), as well as injection-molding units (4 and 5). An injection mold (6) is provided between the locking unit (3) and the injection-molding units (4, 5) which exhibits a stationary molding plate (7) on the nozzle side, as well as a movable molding plate (8) on the injection side.

Molding cavities (14) (cavities) which are arranged opposite to one another are provided in the stationary molding plate (7) and the movable molding plate (8) which, when the injection mold (6) is closed, border around the hollow molding spaces for the injected plastic pieces (2) (compare Fig. 2).

The injection mold (6) is intended for the production of plastic brush bodies (2) of the kind which consist of multiple, successively injected components. For this purpose, the injection mold is configured as a reversible tool. Two molding cavity groups (10, 11) are provided in the molding plates to which a reversible section (12, 13) of their own is, respectively, assigned in the molding plate (8) on the injection side. It is made clear by Figure 2 that each molding cavity group (10, 11) has been assigned sixteen molding cavities (14, 14') which are arranged on the molding plates (7, 8) approximately parallel to one another.

The reversible sections (12, 13) fit into two receptacle recesses (15, 16) which are provided in the movable molding plate (8). A central slide shaft (17, 17') is displaceably guided in each of these receptacle recesses (15, 16) on the inside end of which the assigned reversible section (12, 13) is attached, respectively.

The outside ends of these slide shafts (17, 17') are rotatably held on a joint connecting element (18) which, in turn, is /4

connected with a displaceable rod on the side which faces away from the reversible sections (12, 13).

Here, the reversible sections (12, 13) exhibit a joint reversing drive for a synchronous reversing rotating movement - which is not shown in any great detail. For this purpose, the rotating movement of the drive shafts (17, 17') is translated into a unidirectional reversing rotating movement of the reversible sections (12, 13) by means of a toothed belt - or geared drive.

As shown by Fig. 3, the reversible sections (12, 13) can be displaced in the free space which is formed between the molding plates (7, 8) when the injection mold (6) is open, where the reversible sections (12, 13) can be twisted into one of their two different working positions by means of a rotating movement of their slide shafts (17, 17').

Instead of a joint reversing drive, the reversible sections (12, 13) may also exhibit respectively separate reversing drives for a mutually independent reversing rotating movement.

The distance of the rotary axes of the reversible sections (12, 13) which is created by the slide shafts (17, 17') is greater than double the length of the respective diagonal of the reversible section, so that an overlap-free reversing movement of the reversible sections (12, 13) is made possible on a joint plane. The reversible sections (12, 13), respectively, exhibit a part (14a) of the molding cavities (14) which holds the brush head

(compare Fig. 2) while an area (2a) for the brush body's handle of partially injected brush bodies (2) projects towards the outside over the reversible sections (12, 13) (compare Fig. 5). In order to prevent a disturbing contact of the areas (2a) for the brush body's handle which project over the reversible sections (12, 13), the partial injection-molding stations (20) and the finishing injection-molding stations (21) of adjacent molding cavity groups (10, 11) are arranged diagonally in relation to one another.

In Fig. 6, the injection mold (6) is depicted in a closed position. In this closed position, the basic bodies are produced in the partial injection-molding stations (20) while the complete toothbrush bodies (2) are produced in the finishing injection-molding stations (21). As suggested in Fig. 4, the injection mold is subsequently opened far enough by retracting the molding plate (8) on the injection side and the reversible sections (12, 13) located in it, that the reversible sections (12, 13) can be drawn out into the free space which is created between the molding plates (7, 8) (compare Fig. 3). In a succeeding work process, the reversible sections (12, 13) can be rotated by 180° whereby the basic bodies produced in the partial injection-molding stations (20) move into the finishing injection-molding stations (21) at the corresponding reversible section (12 or 13). During this reversing rotating movement, the basic bodies which have been produced in the partial injection-molding stations are held on the head side on the

reversible section (12, 13) while the toothbrush bodies (2) which have been finished in the finishing injection-molding stations are ejected in downward direction, as suggested in Fig. 5. During the reversing rotating movement, the basic bodies are held on the reversible sections (12, 13) in an area which, preferably, is located on the head side, where no changes are made during the subsequent finishing in the finishing injection-molding stations (21). In the area of the molding cavities which is located outside of the holding area of the reversible sections (12, 13) and which borders the receptacle recesses (15, 16), the basic bodies are produced from the plastic component which is used first in the partial injection-molding stations (20) which are re-injected into finished toothbrush bodies (2) in the finishing injection-molding stations (21) by means of the succeeding material components. /5

In the injection mold (6) which is configured as a reversible tool, plastic brush bodies (2) can be produced which consist of multiple successively injected components, whereas these components may differ in color and/or in the material which is used. It is also possible that the components used in the molding cavity groups (10, 11) of the injection mold (6) may additionally differ from each other.

Because two molding cavity groups (10, 11) are provided in the molding plates (7, 8) of the injection mold (6), and because each molding cavity group (10, 11) is assigned one reversible section

(12, 13) of its own, respectively, the dimensional tolerances in the area of the molding cavity groups (10, 11) can be kept so small that even a comparatively greater number of plastic pieces can be produced with the desired accuracy.

Patent Claims

1. Injection mold (6) for the production of plastic brush bodies (2), specifically, toothbrush bodies or similar plastic pieces, which consist of multiple successively injected components with a molding plate (8) on the nozzle side (7) and the injection side, in which (7, 8) molding cavities (14) are provided which, respectively, are assigned to one another, whereas the injection mold (6) is configured as a reversible tool with a rotatable reversible section which is assigned to the molding plate (8) on the injection side, characterized in that multiple groups (10, 11) of molding cavities (14) are provided in the molding plates and in that each group of molding cavities (10, 11) is assigned one reversible section (12, 13) in the molding plate (8) on the injection side, respectively.

2. Injection mold, in accordance with Claim 1, characterized in that two groups (10, 11) of molding cavities are provided specifically, in that each group (10, 11) of molding cavities is preferably assigned sixteen or more molding cavities (14), and in that the molding cavities (14) are arranged in parallel to one another, specifically.

3. Injection mold, in accordance with Claim 1 or 2, characterized in that the reversible sections (12, 13) respectively exhibit a part (14a) of the molding cavities (14) which holds the brush head and an area for the brush body's handle (2a) of partially injected brush bodies (2) which projects towards the outside over the reversible sections (12, 13), and that the direction of rotation of adjacent reversible sections (12, 13), as well as the position of the partial injection-molding stations (20) and of the finishing injection-molding stations (21) of adjacent molding cavity groups (10, 11) is provided, so that the ends of the handles of, at least, one molding cavity group (10, 11) pivot over the outside area which faces away from the adjacent group (11, 12) of molding cavities.

4. Injection mold, in accordance with any of the Claims 1 to 3, characterized in that the reversible sections (12, 13) exhibit a joint reversing drive for a synchronous reversing rotating movement and that, during a unidirectional rotating movement of the reversible sections (12, 13), the partial injection-molding stations (20) and the finishing injection-molding stations (21) of adjacent groups (10, 11) of molding cavities are arranged diagonally in relation to one another, and the rotary direction for pivoting the projecting handle ends (20) are preferably provided over the outside areas. /6

5. Injection mold, in accordance with any of the Claims 1 to 3, characterized in that the reversible sections (12, 13) respectively exhibit separate reversing drives for a reversing rotating movement which is mutually independent.

6. Injection mold, in accordance with any of the Claims 1 to 5, characterized in that the distance of adjacent reversible sections (12, 13) is dimensioned for an overlapping reversing movement on a joint plane, and that, with rectangular reversible sections (12, 13), the distance of their rotary axes is greater than double the length of the respective diagonal of the reversible section.

7. Injection mold, in accordance with any of the Claims 1 to 5, characterized in that the envelope curves of adjacent reversible sections (12, 13) overlap and these reversible sections (12, 13) can be drawn out and pivoted successively, or can be drawn out at different distances, and on different pivot planes.

Accompanied by 6 page(s) of drawings

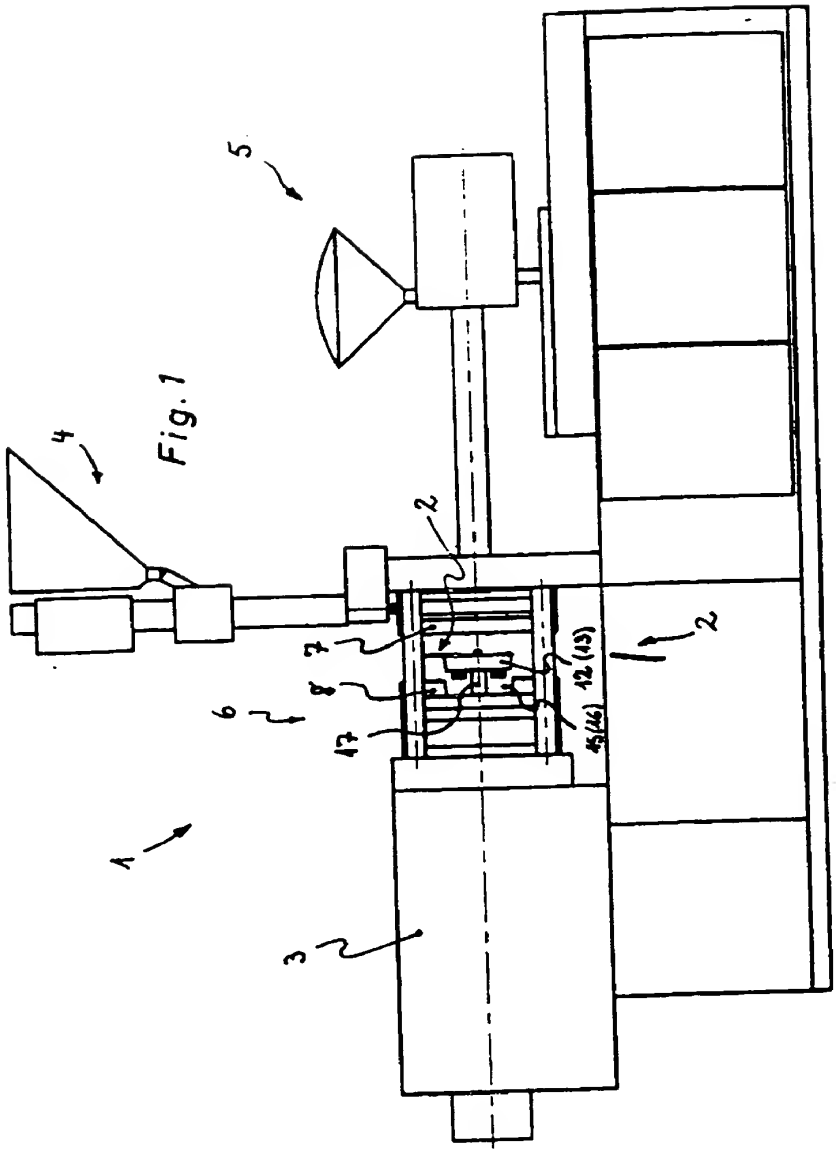

Fig. 1

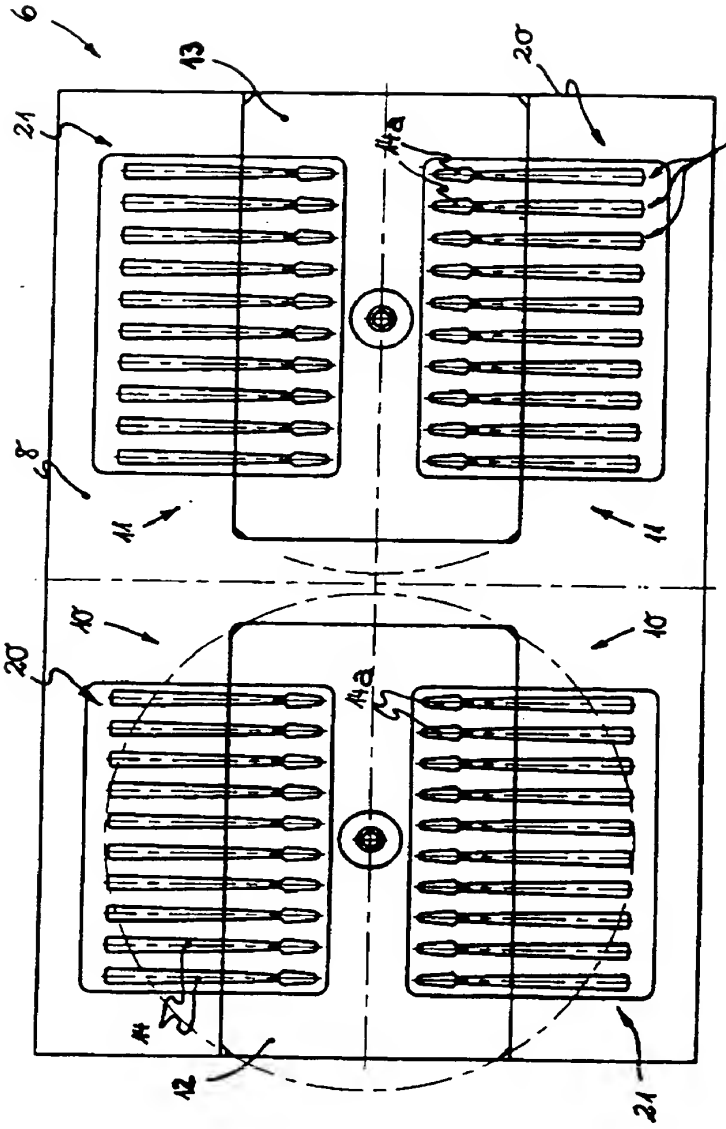

Fig. 2

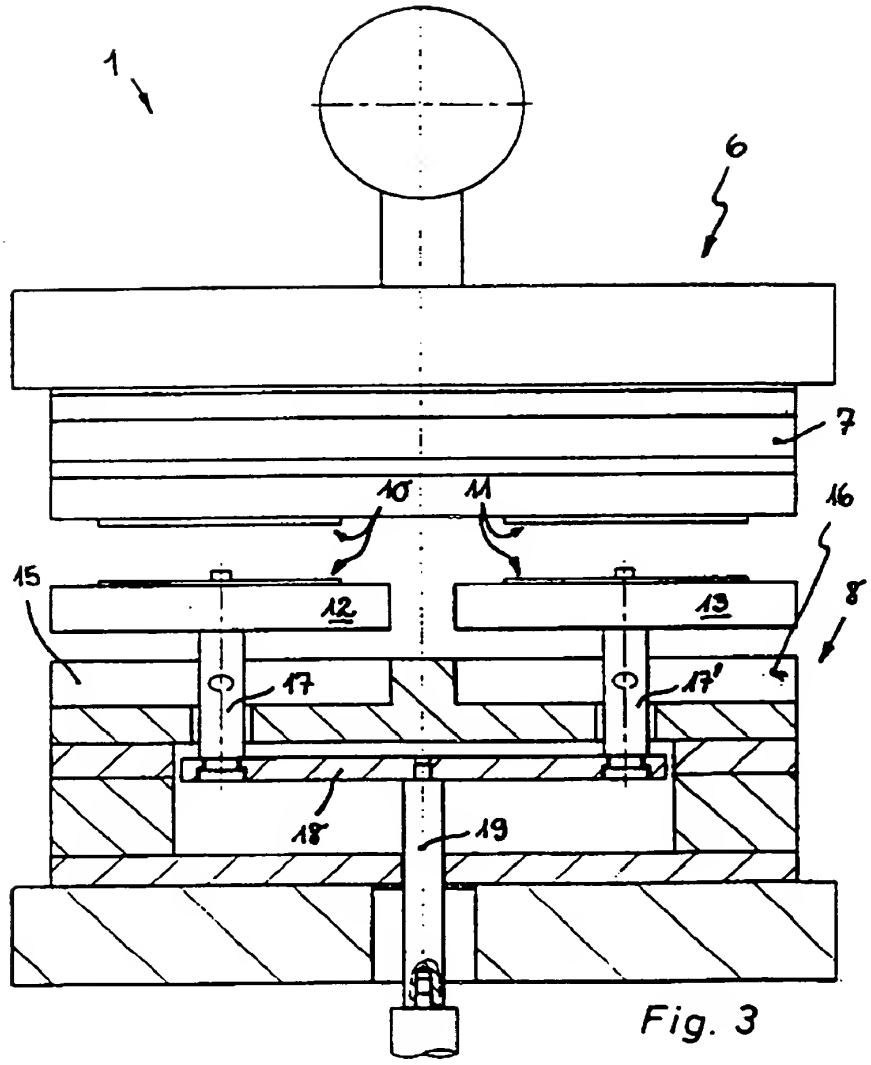

Fig. 3

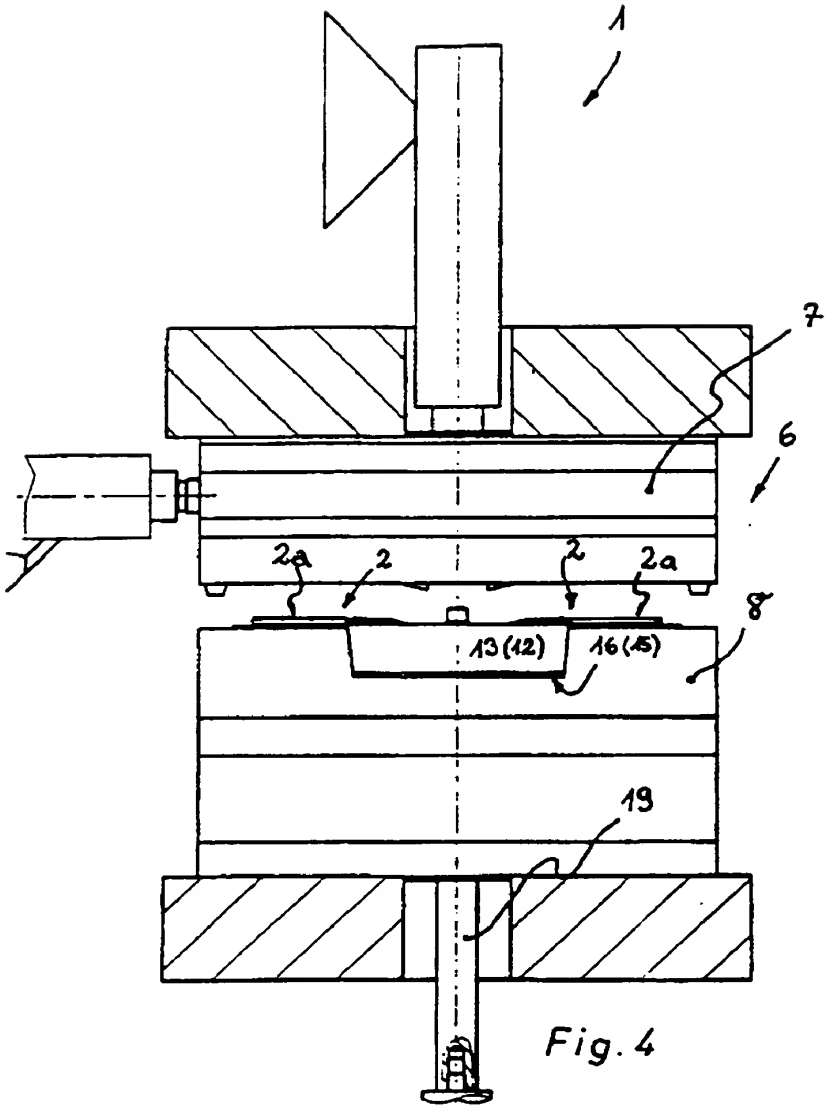

Fig. 4

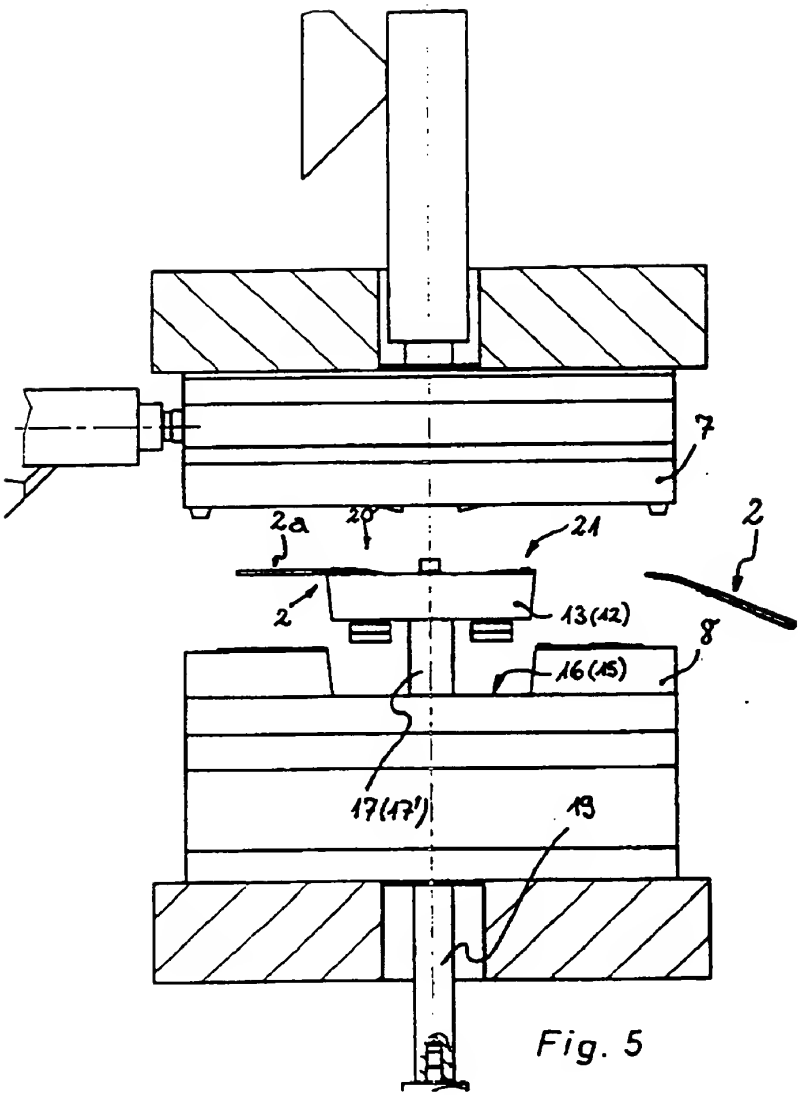

Fig. 5

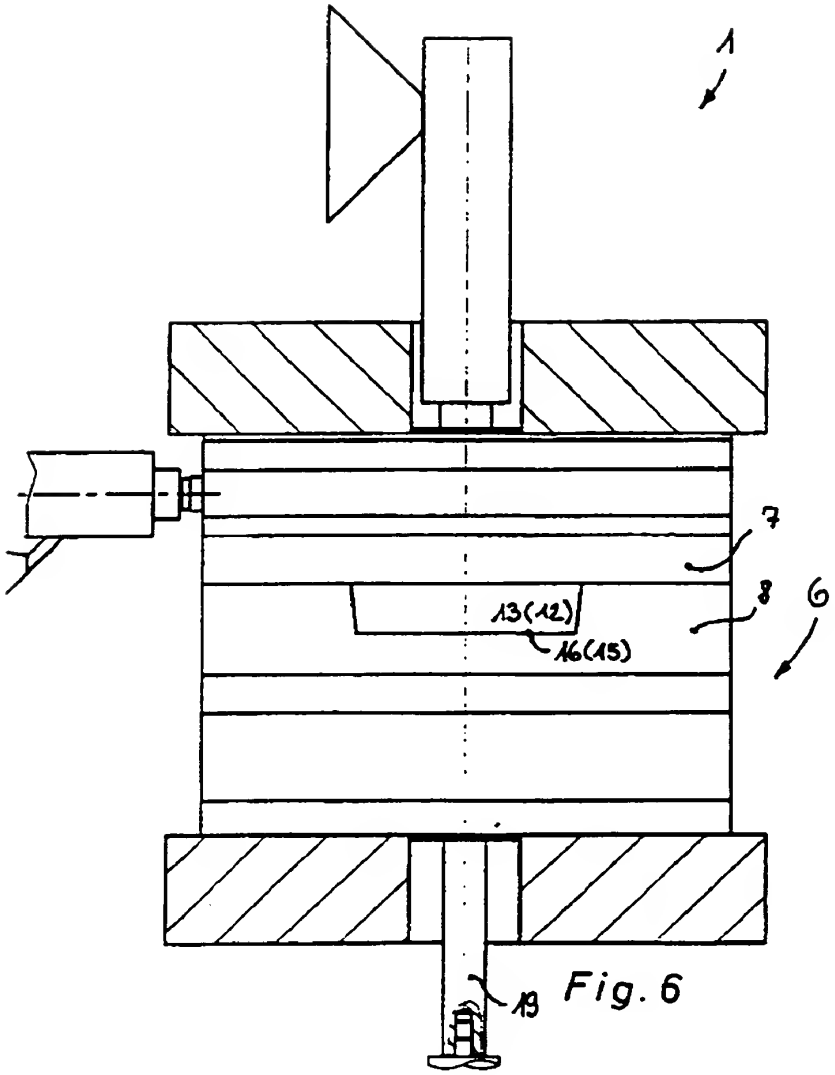

Fig. 6